ELECTRICAL PLUG MECHANISM AND ELECTRICAL RECEPTACLE FOR ELECTRICAL CELL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electrical plug mechanism and an electrical receptacle, and in particular to an electrical plug and an electrical receptacle for use in at least two electrical cells in series or in parallel which can avoid electrical shock and generate electrical current with more amperes.

2. Description of Related Art

When two electrical cells, such as, for example, two electrical cells of an uninterrupted power system (UPS), are in series or in parallel, a user may receive an electrical shock because an electrical plug and electrical receptacle of the electrical cell are electrically connected and the user does not know which part of the electrical plug and the electrical receptacle carry electrical current. Thus, a technical solution to the situation is necessary.

To overcome the shortcomings above, as shown in FIGS. 1 and 2, a conventional electrical plug 4 has a plurality of pins 41 which are respectively enclosed by tubes 42, and a gap 43 is positioned between the pins 41 and the

tubes 42. An isolation end 411 is positioned in each of the pins 41, and each of the pins 41 is enclosed by an arch-shaped spring 412.

Referring to FIGS 1 and 2, a conventional electrical receptacle 3 has a housing 31, and a plurality of holes 33 are defined in the housing 31 and correspond to the pins 41 of the conventional electrical plug 4. Further, a gap 34 is positioned between the housing 31 and each of holes 33 and corresponds to each of the tubes 42 of the conventional electrical plug 4. Thus, when the conventional electrical plug 4 is inserted in the conventional electrical receptacle 3, the arch-shaped spring 412 is electrically connected with the inner surface (not shown) of each of the holes 33. In addition, the conventional electrical receptacle 3 also has a recess 321 of an extension 32, which is sized to receive the conventional electrical plug 4. As described above, the conventional electrical receptacle 3 and the conventional electrical plug 4 are electrically connected and isolated from the environment so the user is not likely to receive an electrical shock.

However, the pins 41 of the conventional electrical plug 4 are electrically connected with the holes 33 of the conventional electrical receptacle 3 via the arch-shaped spring 412. Contact between the pins 41 and the arch-shaped spring 412 thus results in high resistance and high thermal temperature, known as "the second contact". In addition, the pins 41 are

isolated from the environment by the tubes 42, but the design of the electrical equipment must conform to safety standards for electrical equipment that prevent the user's fingers from penetrating into the holes 33 and receiving an electrical shock, so the diameter of tubes 42 cannot be extended and maximum electrical current of the pins 41 cannot exceed 25 amperes. In this regard, the conventional electrical receptacle 3 and the conventional electrical plug 4 are only suitable for an electrical current less than 25 amperes.

Thus, there is need to develop an electrical plug mechanism and an electrical receptacle for use in at least two electrical cells.

SUMMARY OF THE DISCLOSURE

It is an object of the present invention to provide an electrical plug mechanism and electrical receptacle to avoid electrical shock.

It is an object of the present invention to provide an electrical plug mechanism and electrical receptacle that has low resistance and thermal temperature and carries an electrical current greater than 25 amperes.

In order to accomplish the object of the present invention, the present invention provides an electrical plug mechanism and an electrical receptacle. The present invention includes an electrical plug, a plug guard and an electrical receptacle. The electrical plug has an end surface, and a plurality of protruding

plates and a plurality of holes defined on the end surface. A plurality of shafts correspond to and travel through the holes of the end surface. The plug guard has hollow protrusions corresponding to the protruding plates of the electrical plug, grooves corresponding to the hollow protrusions and holes corresponding to the shafts. The electrical receptacle has holders corresponding to the protruding plates.

BRIEF DESCRIPTION OF DRAWINGS

The present invention can be fully understood from the following detailed description and preferred embodiment with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of a mechanism of a conventional electrical plug and electrical receptacle;

FIG. 2 is a cross-sectional view of the mechanism of the conventional electrical plug and electrical receptacle;

FIG. 3 is an exploded view of an electrical plug and an electrical receptacle of the present invention;

FIG. 4 is another exploded view of an electrical plug and an electrical receptacle of the present invention;

FIG. 5 is a cross-sectional view of the electrical plug and the electrical

receptacle of FIG. 4 before they are combined;

FIG. 6 is a cross-sectional view of the electrical plug and the electrical receptacle of FIG. 4 before they are separate;

FIG. 7 is a perspective view of the mechanism of the electrical plug and the electrical receptacle in accordance with the present invention;

FIG. 8 is a perspective view of the electrical plug in accordance with the present invention;

FIG. 9 is an enlarged perspective view of a holder of the present invention; and

FIG. 10 is a plan elevational view of the electrical plug in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following detailed description is of the best presently contemplated modes of carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating general principles of embodiments of the invention. The scope of the invention is best defined by the appended claims.

Referring to FIGS. 3-10, an electrical plug mechanism and an electrical

receptacle in accordance with the present invention is shown. In one embodiment of the present invention, the electrical plug 22 has a protrusion portion 22a and a receptacle portion 22b. The electrical plug 20 has a main body 201 and a mounting portion 208 that are removably coupled. When the main body 201 and the mounting portion 208 are assembled, an end surface 2083 of the mounting portion 208 is visible.

Assembly of the electrical plug is described as follows. A plurality of protruding plates 206, shafts 211 and resilient members 210 are positioned at the mounting portion 208, and electrical cable 23 positioned within the main body 201 is electrically connected to the protruding plates 206. Then, the mounting portion 208 is fixedly positioned on the main body 201 by a plurality of screws 212 so that assembly of the electrical plug 20 is complete. The plug guard 21corresponds to the protruding plates 206 of the mounting portion 208, and the plug guard 21 is axially connected to the end surface 2083 of the mounting portion 208 by screw 21e, thereby resulting in the electrical plug 20 with the plug

guard 21.

The electrical plug of the present invention comprises main body 201 and mounting portion 208. The mounting portion 208 is cylindrical-shaped and an end surface 2083 thereof is enlarged. A plurality of protuberances 2082 are positioned near the end surface 2083, and three grooves 2081 are positioned away from the end surface 2083. The protruding plates 206 extends through the end surface 2083 of the mounting portion 208 and are fixedly positioned on the mounting portion 208 by screws 207 and mounting washers 205.

Further referring to FIG. 3, the end surface 2083 of the mounting portion 208 has a hole 209, a plurality of screw holes 209a and a plurality of holes 209b. The hole 209 is positioned at the center of the end surface 2083, and the screw holes 209a are positioned near the periphery of the end surface 2083. The holes 209b are positioned between the screw holes 209a and the hole 209. In addition, three stubs 209c are defined on the end surface 2083 and axially extend from the end surface 2083 so that the stubs 209c can be inserted in

the corresponding annular grooves (not shown) of the plug guard 21.

Further, the resilient member 210 are respectively sized to receive the shafts 211. Resilient member 210 and the shafts 211 are inserted in the holes 209b, as shown in FIG. 5. In this regard, the shafts 211 can move back and forth due to resilience of the resilient member 210.

The main body 201 is cylindrical and hollow, and one end of the main body 201 is connected with the electrical cable 23 and has a plurality of screw holes 202 therein. A mounting block 204 is fixedly positioned within the main body 201 by threading a plurality of screws 203 through the screw holes 202. In this regard, if the screws 203 are threaded through the screw holes 202 by more turns, the electrical cable 23 will be fixed much more tightly. Further, a plurality of electrical wires with smaller diameter (not shown) of the electrical cable 23 are fixed to the grooves 2081 of the mounting portion 208 by the screws 207.

Finally, the mounting portion 208 is fixedly fitted to the main body 201 because the screws 212 thread through a threaded protrusion (not shown) of the main body 201. Thus, the assembly of the electrical plug 20 is complete.

The plug guard 21 is circular-shaped and has a hole 21c, a plurality of

holes 21d and a plurality of hollow protrusions 21a. The hole 21c and the holes 21d of the plug guard 21 respectively correspond to the hole 209 and the holes 209b of the mounting portion 208. Each of the hollow protrusions 21a corresponds to and is sized to receive each of the protruding plates 206. The plug guard 21 is axially connected to the end surface 2083 of the mounting portion 208, and each of the hollow protrusions 21a is sized to receive each of the protruding plates 206 because the screw 21e threads through the hole 209, which is threaded. Further, each shaft 211 extends through and travels within each hole 21d of the plug guard 21 so that the electrical plug 20 and the plug guard 21 cannot axially be rotated with respect to each other.

Further, a groove 21b is positioned in each of the hollow protrusions 21a and is L-shaped so that each protruding plate 206 can be removed from each hollow protrusion 21a.

The electrical receptacle 22 has a plurality of holders 221 and the protrusion portion 22a and the receptacle portion 22b.

The protrusion portion 22a is box-shaped and has a plurality of fixing portions 22a1, a plurality of pins 22a4 and a plurality of U-shaped grooves 22a5. The pins 22a4 and the U-shaped grooves 22a5 extend axially from the protrusion portion 22a. A planar portion 221b of the holder 221 (see FIG. 9) passes through the protrusion portion 22a and moves into the fixing portion 22a1 so that

the holder 221 can be fixed to the protrusion portion 22a by bolts 22a2 and screws 22a3.

The receptacle portion 22b includes a plurality of circular apertures 22b2 and a plurality of holder grooves 22b6, and each of the circular apertures 22b2 is in communication with each of the holder grooves 22b6. The receptacle portion 22b also has a plurality pins 22b4 and a plurality of U-shaped grooves 22b5. The receptacle portion 22b corresponds to the protrusion portion 22a, so the pins 22b4 correspond to the pins 22a4. The U-shaped grooves 22a5 are in communication with the U-shaped grooves 22b5. The holder 221 is positioned within the electrical plug 22 by the holding portion 221a so the holder 221 can be covered and prevents the user from being got electrical shock.

The receptacle portion 22b is adapted to receive the electrical plug 20 and has guide grooves 22b1 in the receptacle portion 22b. Each of the guide grooves 22b1 is adapted to receive each of the protuberances 2082 of the plug guard 21. Thus, the electrical plug 20 cannot be unplugged at any angle with respect to the electrical plug 22. A plurality of pins 22b3 of the receptacle portion 22b correspond to the shafts 211 so that the pins 22b3 can extend through the holes 21d of the plug guard 21 and pushes the shafts 211 back and forth due to resilience of the resilient members 210. Thus, the plug guard 21 can be axially rotated with respect to the electrical plug 20.

As shown in FIG. 9, the holder 221 has the holding portion 221a and the planar portion 221b. The holding portion 221a is U-shaped, and the planar portion 221b is integrally formed with the holding portion 221a. In addition, the holding portion 221a of the holder 221 has two curved and symmetrical holding planes that are adapted to receive the protruding plates 206. Contact between the holder 221 and the protruding plates 206 results in lower resistance and lower thermal temperature, known as "the first contact".

Further, the holder 221 has a plurality of grooves 221a1 and a plurality of conductive beams 221a2 so that the holder 221 is in electrical contact with the protruding plates 206 and area of contact between the holder 221 and the protruding plates 206 increases. Thus, the present invention can carry electrical current greater than 25 amperes. In addition, according to the present invention, contact area between the holder 221 and the protruding plates 206 can be further increased so that the present invention can carry electrical current with significantly more than 25 amperes.

The holder 221 is positioned by the pins 22a4 and the pins 22b4 that corresponds to the holder grooves 22b6. The circular apertures 22b2 of the receptacle portion 22b correspond to the hollow protrusions 21a of the plug guard 21. Thus, when the electrical plug 20 is inserted in the electrical receptacle 22, the hollow protrusions 21a of the plug guard 21 are adapted to fit

to the circular apertures 22b2 and the protuberances 2082 are adapted to fit to the guide grooves 22b1. Further, the shafts 211 of the electrical plug 20 can be pushed by the pins 22b3 of the electrical receptacle 22. The electrical plug 20 can be freely rotated with respect to the electrical receptacle 22.

After the electrical plug 20 is rotated, the protuberances 2082 will further move into the end of the guide grooves 22b1, and the protruding plates 206 will move to the grooves 21b of the hollow protrusions 21a. In a word, when the electrical plug 20 is not inserted in the electrical receptacle 22 yet, the protruding plates 206 will not move out of the hollow protrusions 21a. As long as the electrical plug 20 is already inserted in the electrical receptacle 22, the protruding plates 206 appear. In this regard, the electrical plug is electrically connected to the electrical receptacle so that the present invention prevents user from being electrically shocked.

While the invention has been described with reference to the preferred embodiments, the description is not intended to be construed in a limiting sense. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as may fall within the scope of the invention defined by the following claims and their equivalents.